IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Attorney Docket No. 040849/0177

In re patent application of
Yu Wang et al.

Serial No. 09/682,519 Group Art Unit: 2832

Filed: August 13, 2001 Examiner: L. DONOVAN

For: HIGH FIELD OPEN MRI MAGNET ISOLATION SYSTEM AND METHOD

BRIEF ON APPEAL

Commissioner for Patents
Washington, D.C. 20231

Sir:

This Appeal Brief is being filed in triplicate together with a check in the amount of $310.00 covering the appeal fee. Appellants hereby appeal the July 11, 2002 final rejection of claims 1-22 in the above-identified application to the Board of Patent Appeals and Interferences.

REAL PARTY IN INTEREST

The real party in interest is General Electric Company.

RELATED APPEALS AND INTERFERENCES

The undersigned is not aware of any related appeals or interferences.

STATUS OF CLAIMS

Claims 1-38 are pending. Claims 23-38 are withdrawn from consideration. A copy of the pending claims is presented in the APPENDIX.

Claims 1-22 were finally rejected under 35 U.S.C. § 103(a). Claims 1, 7-11, 14 and 19-21 were finally rejected as being obvious over Laskaris et al. (U.S. Patent No. 6,198,371, "Laskaris") in view of Kim (U.S. patent No. 6,336,794).

Claims 2-4, 12-13, 15-17 and 22 were finally rejected as being obvious over Laskaris in view of Kim, and further in view of Ohsaki (U.S. Patent No. 6,6202,492).

Claims 5-6 and 18 were finally rejected as being obvious over Laskaris and Kim and further in view of Braun (U.S. Patent No. 4,781,363) in the Final Office Action mailed July 11, 2002 ("the Office Action").

STATUS OF AMENDMENTS

The claims were not amended after the final rejection.

SUMMARY OF INVENTION

In accordance with one preferred aspect of the present invention, there is provided an open MRI system 1, comprising an open MRI magnet system 10, and a vibration isolation system 2, 20 adapted to support the MRI magnet system 10. See paragraphs [0007] and [0017] and Figures 1 and 2.

In accordance with another preferred aspect of the present invention, there is provided an open MRI system comprising a first 12 and a second assembly 14. Each assembly comprises a longitudinally-extending and generally-vertically-aligned axis 22, at least one superconductive main coil 24 positioned around the axis and carrying a main electric current in a first direction, and a vacuum enclosure 26 enclosing said at least one superconductive main coil 24. The system further comprises at least one support beam (16 or 18) external to the vacuum enclosures, having a first end 34 attached to said first assembly 12 and having a second end 36 attached to said second assembly 14. The system

further comprises a vibration isolation system 20. See paragraphs [0008] and [0017]-[0020] and Figure 2.

ISSUES

The issue are whether claims 1, 7-11, 14 and 19-21 are obvious over Laskaris and Kim, whether claims 2-4, 12-13, 15-17 and 22 are obvious over Laskaris, Kim and Ohsaki, and whether claims 5-6 and 18 are obvious over Laskaris and Braun.

GROUPING OF CLAIMS

Claims 1, 7-11, 14 and 19-21 stand or fall together.

Claims 2-4, 12-13, 15-17 and 22 stand or fall together.

Claims 5-6 and 18 stand or fall together.

SUMMARY OF THE ARGUMENT

The Office Action asserts that Laskaris does not teach away from Appellants' claimed invention. Appellants submit that Laskaris teaches away from the claimed invention because Laskaris teaches to rigidly fix a MRI system to the floor in order to reduce MRI vibration, rather than to provide a vibration isolation system.

The Office Action asserts that Kim provides motivation to add a vibration isolation system to an MRI assembly. Appellants submit that Kim does not provide such motivation. Kim teaches how to isolate the environment from machine (i.e., compressor) vibration, because there is a need to isolate the environment from compressor vibration. Kim does not teach to isolate a machine from environmental vibration, as stated on page 5, lines 14-15 of the Office Action. There is also no motivation to isolate the environment from vibration of the MRI of Laskaris.

The Office Action also asserts that Kim is analogous art. Appellants submit that Kim is non-analogous art because the device of Kim is not in the field of Appellants' endeavor and is not pertinent to the problem solved by the Appellants.

ARGUMENT

I. Laskaris Teaches Away From a Vibration Isolation System

The Office Action asserts that Laskaris does not teach that the skirt is used for vibration reduction and that applicant has not claimed any structural differentiation between the vibration design of Laskaris and the invention as claimed. Appellants respectfully disagree.

The Office Action is incorrect when it states that "Laskaris does not teach that the skirt is used for vibration reduction." The Laskaris patent specifically states that the support skirt "stiffens the support of the magnet...which reduces the susceptibility of the open magnet to vibrate at the dominant low-excitation-frequencies imparted to the magnet by the presence of a cryocooler coldhead attached to an assembly." (Col. 2, Lines 58-64). Laskaris teaches away from the claimed invention since the MRI system in Laskaris must be rigidly fixed to the floor to reduce vibration. Laskaris' system is a rigid vibration suppression system and not a vibration isolation system. The claimed invention is distinguished from Laskaris as it isolates vibration from the MRI, rather than fixes the MRI to the floor. "Isolation" does not mean rigid mount because rigid mount allows floor vibrations to permeate through the MRI. An isolation system does not. "Isolation" is defined as "to render free of external influence." WEBSTER'S II NEW COLLEGE DICTIONARY 588 (1995) (attached to the Response filed May 6, 2002). The claimed invention renders the MRI system free of external vibrations. In contrast, Laskaris rigidly couples the MRI to the floor, thus directly connection the MRI to externalities.

As correctly noted by the Office Action, Laskaris does not teach a vibration isolation system. In fact, Laskaris teaches to rigidly mount the magnet assembly 10 to the floor 42 by using a rigid support skirt 20 (see Figures 1 and 2 and col. 4, lines 31-46 of Laskaris). The skirt 20 contains a rigid cylindrical wall 50 that is bolted to the floor 42. The stated advantage from using the skirt of Laskaris is that it "stiffens the support of the magnet" to reduce vibration. (See column 2, lines 55-65 of Laskaris). Thus, Laskaris actually teaches away from using a vibration isolation system with the MRI magnet assembly because Laskaris solves the vibration problem by making the MRI mount to the

floor more rigid than before, rather than less rigid. A prior art reference cannot be used in a § 103(a) rejection where the prior art reference teaches away from the claimed invention. MPEP § 2145 (X)D.

One of ordinary skill in the art would not be motivated to non-rigidly mount an MRI system to the floor from the teaching of Laskaris because one of ordinary skill in the art understands that MRI measurements are very position sensitive. Thus, one of ordinary skill in the art would understand that a non-rigid MRI mounting of the MRI system of Laskaris would cause errors in the MRI measurements based on the teaching in Laskaris.

In contrast, the present inventors have realized that all sites containing an MRI system are subject to some kind of environmental disturbance, such as from electrical or mechanical equipment installed within the same building. The environmental disturbances or vibrations excite the MRI system magnets through the MRI system's attachment to the building, such as through the floor, walls or ceiling of a room of a building containing the MRI system. The most significant such attachment is the foot support, which is fastened to the floor to secure the magnets of the MRI system. The foot support transmits the environmental disturbances and vibrations to the magnets of the MRI system, thus degrading the image quality. This is discussed in paragraph [0012] of the present application.

Thus, the present application teaches to proceed contrary to the accepted wisdom in the art. The claimed invention is directed to using a vibration isolation system with a magnet assembly, while the accepted MRI magnet assembly is rigidly mounted to the floor in the prior art. Proceeding contrary to the accepted wisdom in the art is evidence of non-obviousness. MPEP § 2145(X)D(3).

II. There is No Motivation to Combine Laskaris and Kim

The Office Action asserts that a skilled artisan would have been motivated to seek solutions, such as Kim, to isolate machinery from vibrations. Appellants respectfully disagree. Kim provides no motivation to add a vibration isolation system to a magnet assembly. Kim's invention teaches how to isolate the environment from machine vibration.

Laskaris and the Appellants' invention teach how to isolate a machine from environmental vibration. Kim teaches a compressor assembly with enhanced vibration suppression. Kim provides no teaching or suggestion that a vibration isolation system would be useful as a support for an MRI magnet assembly. The compressor of Kim vibrates and produces noise. The vibration isolation system of Kim is used to reduce the vibration and noise from the compressor to the environment (see abstract and Col. 1, lines 43-49 of Kim). In contrast, transmission of vibration and noise from the MRI to the environment is not a concern in the MRI of Laskaris. Instead, Laskaris is concerned with limiting the vibration of the MRI magnet assembly itself due to the presence of a cryocooler coldhead (see col. 2, lines 1-5 and col. 2, line 65 to col. 3, line 17 of Laskaris). Thus, there is no motivation to combine Laskaris and Kim, since reduction of vibration from the MRI to the environment is not a concern in Laskaris. The differences between Laskaris, Kim and the claimed system are summarized in the table below.

Laskaris	Suppresses vibration of	MRI	from	cryocooler coldhead
Kim	Isolates	environment	from	compressor
Claimed system	Isolates	MRI	from	environment

Furthermore, if the MRI magnet assembly of Laskaris was modified as suggested in the Office Action, then this would change the principle of operation of the MRI magnet assembly of Laskaris. Such a modification is impermissible according to the last subsection of MPEP § 2143.01. There are different ways to reduce vibration. One way is to ensure that the machine is rigidly mounted to the floor, as taught by Laskaris. The vibration of the MRI magnet assembly of Laskaris is reduced based on this principle of operation (see col. 2, lines 56-65 of Laskaris). In contrast, the claimed invention is based on the opposite principle of reducing magnet assembly vibration by using a vibration isolation system.

There is no motivation to modify the MRI system of Laskaris as suggested by the Office Action because it would change the principle of operation of the MRI system of Laskaris.

III. Kim is Non-Analogous Art

According to MPEP § 2145(IX), a prior art reference is non-analogous art if the prior art reference is not in the field of the Appellants' endeavor and if it is not pertinent to the problem with which the Appellants are concerned. Kim is non-analogous art because it meets both prongs of this test.

First, Kim is directed to a compressor assembly, while the claimed invention is directed to an MRI system. Thus, Kim is clearly not in the field of Appellants' endeavor. The Office Action tacitly admits this when he asserts that Kim is reasonably pertinent to the particular problem Appellants are concerned and fails to discuss whether Kim is in the field of Appellants' endeavor.

Second, Kim is not pertinent to the problem to which the Appellants are concerned. The Office Action asserts that both applicant and Kim seek to isolate machinery from vibration. Appellants respectfully disagree. Kim is concerned with preventing the compressor from vibrating the adjacent support plate. Thus, Kim is concerned with preventing the transfer of the vibration from the compressor to the environment. In contrast, the claimed invention is concerned with preventing the transfer of vibration from the environment to the MRI system. Thus, the claimed invention solves the opposite problem that Kim is trying to solve. Therefore, Kim is non-analogous art and cannot be properly used in a 35 U.S.C. § 103(a) rejection of the claims of the present application.

IV. Dependent Claims Are Separately Patentable

Claims 2-4, 12-13, 15-17 and 22 are grouped together as they include additional limitations. These dependent claims are separately patentable because the prior art does not include the limitations found in those claims. These claims recite an adjustable and site tunable vibration isolation, pneumatic isolators, and active control isolators. The Office Action is correct when it states that the two primary references, Laskaris and Kim do not

recite these limitations. The Office Action asserts that the combination of Ohsaki with Laskaris and Kim renders these claims unpatentable. Appellants respectfully disagree.

Ohsaki is directed to a photolithography exposure apparatus. Ohsaki provides no motivation for providing a vibration isolation system for an MRI system, such as the system of Laskaris. Thus, there is no motivation to combine Laskaris and Ohsaki.

Furthermore, claims 2-4, 12-13, 15-17 and 22 were rejected over Laskaris, which teaches an MRI system, in view of Kim, which teaches a compressor, in view of Ohsaki, which teaches an exposure apparatus. Applicants submit that this combination is based on an improper hindsight reconstruction gained solely from the applicants' disclosure. One of ordinary skill in the art would not be motivated to combine these three unrelated references from different fields of endeavor without relying on the knowledge gained from the applicants' disclosure. See MPEP 2145(X)A.

Claims 5-6 and 18 are grouped together as they recite a balance mass that is optionally adjustable. These dependent claims are separately patentable because the prior art does not include the limitations found in those claims. The Office Action is correct when it states that Laskaris and Kim do not disclose the use of balance mass. The Office Action asserts that the combination of Braun with Laskaris and Kim renders these claims unpatentable. Appellants respectfully disagree.

Braun is directed to a vibration isolation system that is used in engines, pumps and helicopters (col. 1, lines 14-20). Braun provides no motivation for providing a vibration isolation system for an MRI system, such as the system of Laskaris. Thus, there is no motivation to combine Laskaris and Braun.

Furthermore, claims 5-6 and 18 were rejected over Laskaris, which teaches an MRI system, in view of Kim, which teaches a compressor, in view of Braun which teaches a vibration isolation system that is used in engines, pumps and helicopters. Applicants submit that this combination is also based on an improper hindsight reconstruction gained solely from the applicants' disclosure. One of ordinary skill in the art would not be motivated to combine these three unrelated references from different fields of endeavor

without relying on the knowledge gained from the applicants' disclosure. See MPEP 2145(X)A.

CONCLUSION

Accordingly, Appellants respectfully solicit the Honorable Board of Patent Appeals and Interferences to reverse the rejection of the pending claims and pass this application on to allowance.

Respectfully submitted,

11/13/02

Date

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This Appeal Brief is being filed in triplicate together with a check in the amount of $320 (large entity) covering the appeal fee. If this fee is deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to the undersigned deposit account 19-0741.

APPENDIX

1. An open MRI system comprising:
an open MRI magnet system; and
a vibration isolation system adapted to support the MRI magnet system.

2. The open MRI system of claim 1, wherein a spring constant and damping of the vibration isolation system are adjustable.

3. The open MRI system of claim 1, wherein the vibration isolation system comprises a plurality of pneumatic isolators.

4. The open MRI system of claim 1, wherein the vibration isolation system comprises a plurality of active vibration control isolators.

5. The open MRI system of claim 1, further comprising a balance mass.

6. The open MRI system of claim 5, wherein the balance mass is adjustable.

7. The open MRI system of claim 1, wherein the vibration isolation system is secured to a floor and the MRI magnet system is attached over the vibration isolation system.

8. The open MRI system of claim 1, wherein the vibration isolation system is configured within a footprint of the MRI magnet system.

9. The open MRI system of claim 1, further comprising a structural holder positioned between the vibration isolation system and the MRI magnet system.

10. The open MRI system of claim 1, wherein the vibration isolation system is retrofitted to a preexisting MRI magnet system.

11. The open MRI system of claim 10, wherein the vibration isolation system is mounted on posts such that MRI magnet system supports do not contact a floor of a site where the MRI magnet system is located.

12. The open MRI system of claim 1, wherein the vibration isolation system is site tunable.

13. The open MRI system of claim 11, wherein the vibration isolation system is tuned to minimize the magnet system Q factor and to control a bandwidth of the MRI magnet system vibration response at a predominant MRI magnet exciting frequencies.

14. An open MRI system comprising:

(a) a first assembly comprising:

(1) a longitudinally-extending and generally-vertically-aligned first axis;

(2) at least one superconductive main coil positioned around said first axis and carrying a first main electric current in a first direction; and

(3) a first vacuum enclosure enclosing said at least one superconductive main coil of said first assembly;

(b) a second assembly longitudinally spaced apart from and disposed below said first assembly, comprising:

(1) a longitudinally-extending second axis generally coaxially aligned with said first axis;

(2) at least one superconductive main coil positioned around said second axis and carrying a second main electric current in said first direction; and

(3) a second vacuum enclosure enclosing said at least one superconductive main coil of second assembly;

(c) at least one support beam external to said first and second vacuum enclosures having a first end attached to said first assembly and having a second end attached to said second assembly; and

(d) a vibration isolation system.

15. The open MRI system of claim 14, wherein a spring constant and damping of the vibration isolation system are adjustable.

16. The open MRI system of claim 14, wherein the vibration isolation system comprises a plurality of pneumatic isolators.

17. The open MRI system of claim 14, wherein the vibration isolation system comprises a plurality of active vibration control isolators.

18. The open MRI system of claim 14, further comprising an adjustable balance mass.

19. The open MRI system of claim 14, wherein the vibration isolation system is secured to a floor and the MRI magnet system is attached over the vibration isolation system.

20. The open MRI system of claim 14, wherein the vibration isolation system is configured within a footprint of the MRI magnet system.

21. The open MRI system of claim 14, wherein:

the vibration isolation system is retrofitted to a preexisting MRI magnet system; and

the vibration isolation system is mounted on posts such that MRI magnet system supports do not contact a floor of a site where the MRI magnet system is provided.

22. The open MRI system of claim 14, wherein the vibration isolation system is site tuned to minimize the magnet system Q factor and to control a bandwidth of the MRI magnet system vibration response at a predominant MRI magnet exciting frequencies.

23. The method of installing an open MRI system, comprising:

providing the open MRI system which comprises a vibration isolation system and an open magnet system;

measuring environmental disturbances and vibrations at a first site;

selecting the vibration isolation system based on the measuring step; and

installing the MRI system at the first site.

24. The method of claim 23, wherein the step of selecting comprises:

selecting a high damping isolation system when significant low frequency vibrations or disturbances are measured at the first site; or

selecting a low damping isolation system when only high frequency disturbances or vibrations are measured at the first site.

25. The method of claim 24, further comprising adjusting a balance mass to optimize a center of gravity of the magnet system.

26. The method of claim 25, wherein the step of adjusting is performed before or after the step of installing.

27. The method of claim 23, wherein the step of measuring is performed before the step of installing.

28. The method of claim 23, wherein the steps of measuring and selecting are performed before the step of installing.

29. The method of claim 23, further comprising adjusting the damping of the vibration isolation system to minimize the magnet system Q factor and control a bandwidth of a vibrational response at predominant exciting frequencies.

30. The method of claim 23, wherein the vibration isolation system comprises a plurality of pneumatic isolators.

31. The method of claim 23, wherein the vibration isolation system comprises a plurality of active vibration control isolators.

32. The method of claim 23, wherein the step of installing comprises securing the vibration isolation system to a floor, such that the MRI magnet system is provided over the vibration isolation system.

33. The method of claim 23, further comprising:

detaching the MRI system from a floor; and

retrofitting the vibration isolation system to the magnet system of the MRI system prior to the step of installing the MRI system at the first site.

34. A method of retrofitting a preexisting open MRI system comprising attaching a vibration isolation system to a magnet system of the preexisting MRI system.

35. The method of claim 34, further comprising detaching the magnet system from a floor prior to the step of attaching the a vibration isolation system.

36. The method of claim 34, wherein the vibration isolation system comprises a plurality of pneumatic isolators.

37. The method of claim 34, wherein the vibration isolation system comprises a plurality of active vibration control isolators.

38. The method of claim 34, further comprising securing a plurality of posts to a floor and securing the vibration isolation system to the posts, such that the MRI magnet system is provided over the vibration isolation system and such that supports of the preexisting MRI system do not contact the floor.

AF/2832

Atty. Dkt. No. 040849-0177

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Yu WANG et al.

Title: HIGH FIELD OPEN MRI MAGNET ISOLATION SYSTEM AND METHOD

Appl. No.: 09/682,519

Filing Date: 09/13/2001

Examiner: Lincoln D. Donovan

Art Unit: 2832

APPEAL BRIEF TRANSMITTAL

Commissioner for Patents
Washington, D.C. 20231

Sir:

Applicant hereby submits to the Board of Appeals following the Notice of Appeal filed on October 11, 2002.

The item(s) checked below are appropriate:

1. **XX** Appeals Brief with Fee $320.00. (in triplicate), and

2. **XX** A check in the total amount of $320.00 is enclosed for the Appeal Brief fee. The Commissioner is hereby authorized to charge any deficiency or credit any

overpayment to Deposit Account No. 19-0741.

Respectfully submitted,

Date 11/13/02

By _____

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